(12) UK Patent Application (19) GB (11) 2 245 667 (13) A

(43) Date of A publication 08.01.1992

(21) Application No 9014451.0

(22) Date of filing 28.06.1990

(71) Applicant
Ferodo Limited

(Incorporated in the United Kingdom)

20 St Mary's Parsonage, Manchester, M3 2NL, United Kingdom

(72) Inventors
David John Mellor
Geoffrey Swann
Maurice Parker

(74) Agent and/or Address for Service
R F Hadfield et al
Bowdon House, Ashburton Road West, Trafford Park, Manchester, M17 1RA, United Kingdom

(51) INT CL[5]
F16D 69/04

(52) UK CL (Edition K)
F2E EHB E1A1A2 E1A1B

(56) Documents cited
GB 2071795 A GB 1589392 A GB 1160503 A
GB 0921146 A EP 0163030 A2 EP 0084591 A1

(58) Field of search
UK CL (Edition K) F2C C1C3AX, F2E EHB
INT CL[5] F16D
Online databases: W.P.I.

(54) Disc brake pad backplate

(57) A back-plate for a disc brake pad has no spigot through holes. An enhanced key for friction material moulded thereon is provided by means of indentations and projections 7, 8, 14, 17 formed on the back-plate surface, on which the friction material is moulded and bonded, without introducing projections on the opposite back-plate surface.

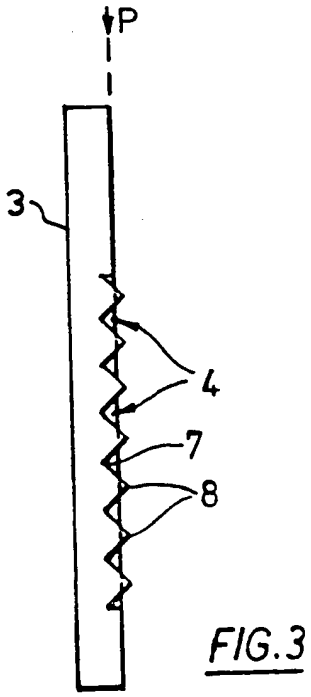

FIG.3

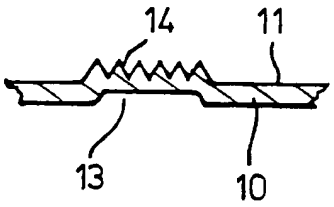

FIG.6

FIG.8

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 245 667 A

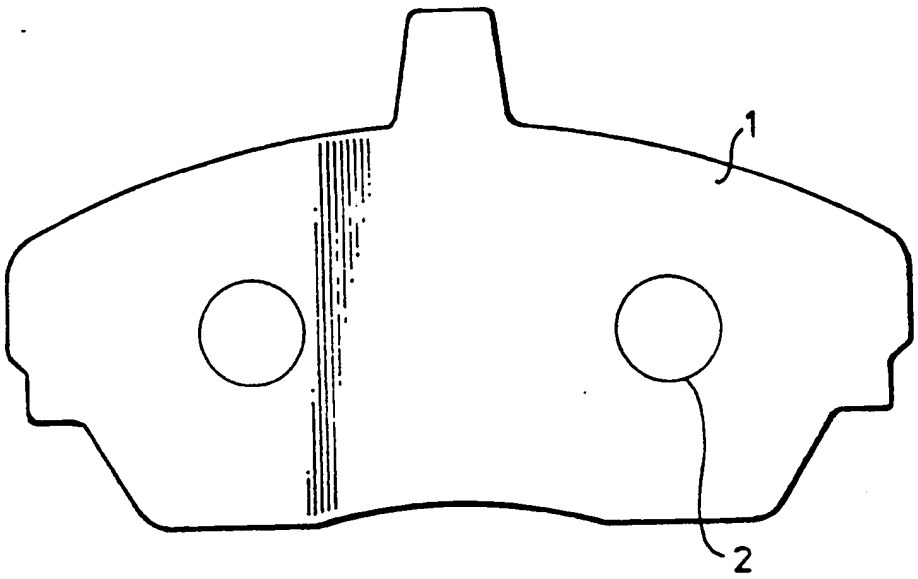

FIG. 1

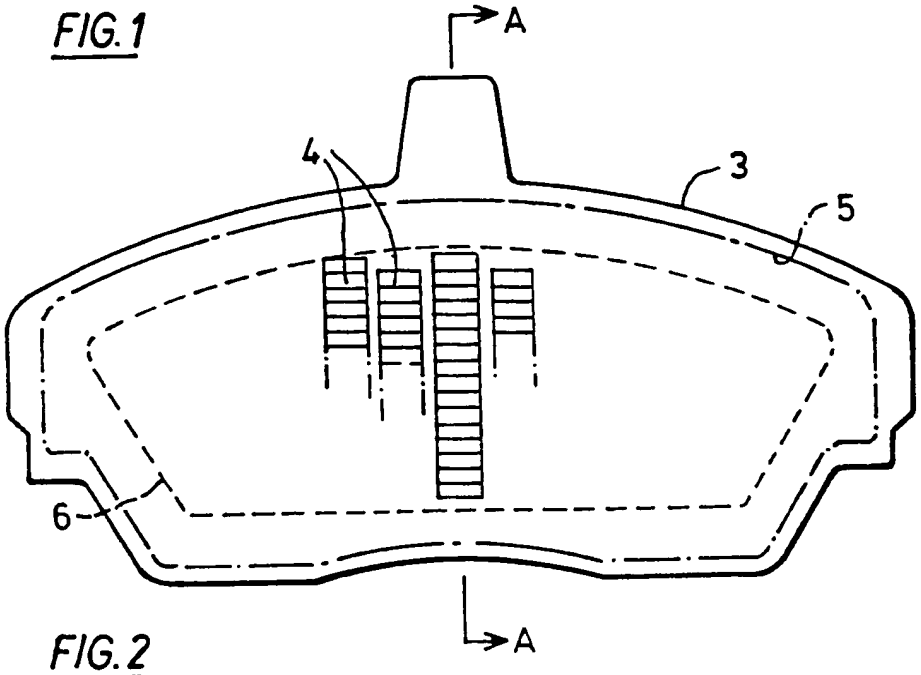

FIG. 2

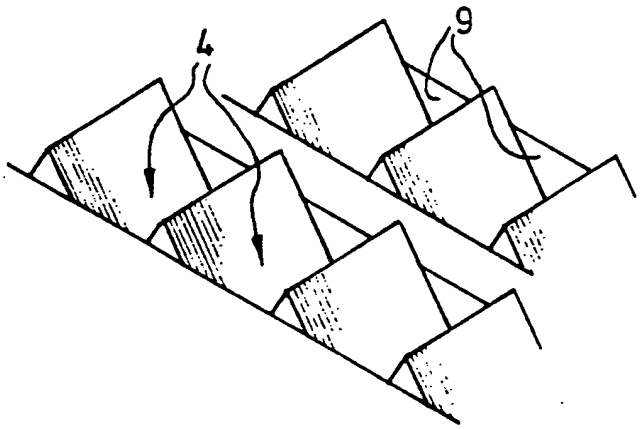

FIG. 4

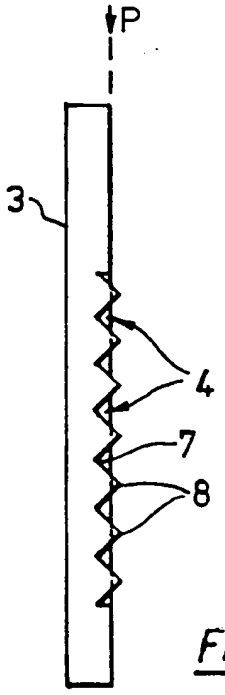

FIG. 3

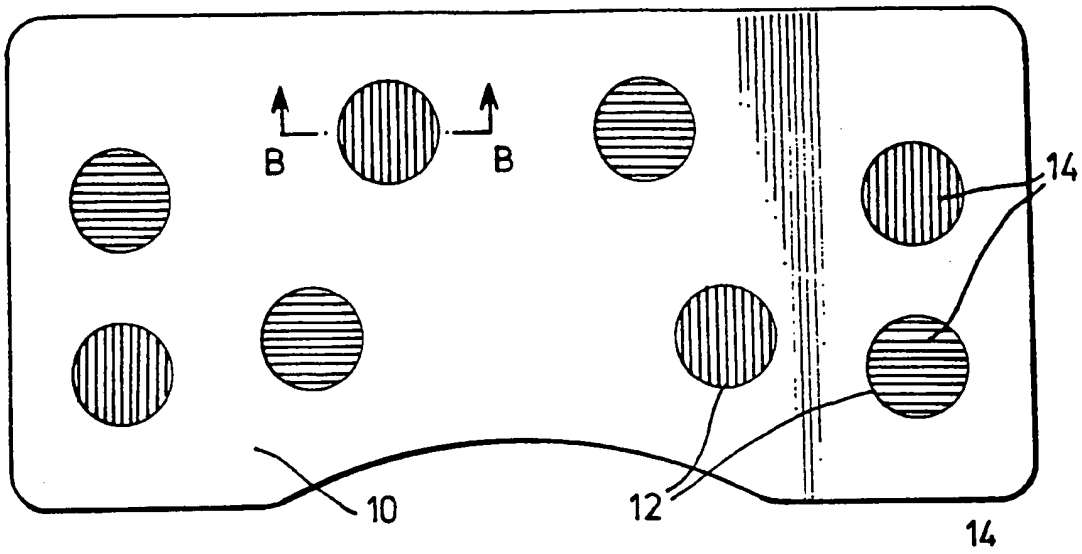

FIG. 5

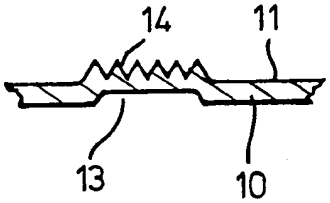

FIG. 6

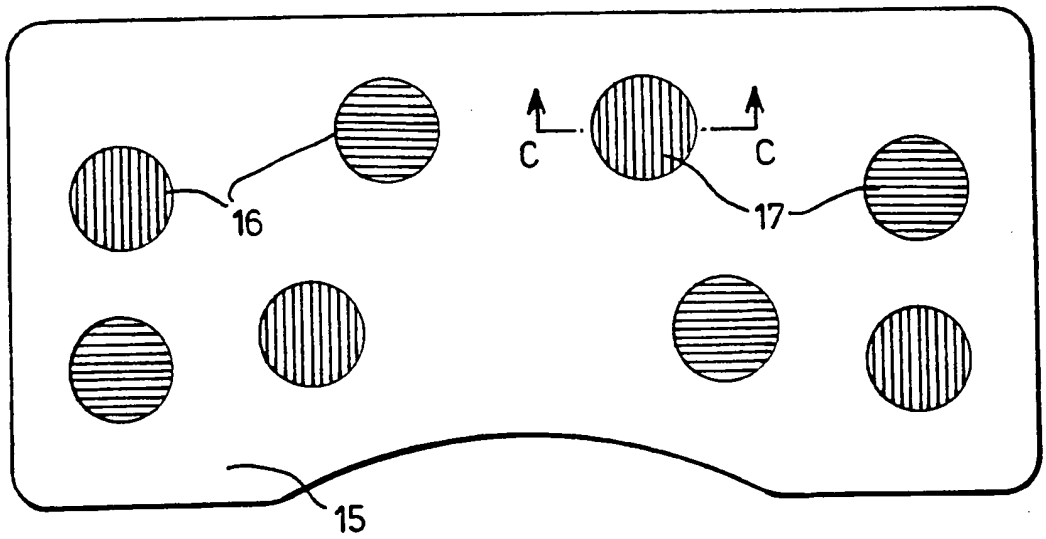

FIG. 7

FIG. 8

Improvements in or relating to disc brake pads

This invention relates to disc brake pads of the kind consisting of a pad of friction material moulded on to a back-plate which is usually of metal such as steel.

When manufacturing disc brake pads for cars and light commercial vehicles it is conventional to provide one or more spigot holes in the back-plate onto which friction material is to be moulded. Such spigot holes provide an enhanced key for the friction material on the plate and operate, together with adhesive between friction material and plate, to keep the pad of friction material in position on the plate under the high shear forces generated on the pads during their use in a disc brake.

It has also been proposed to provide back plates without

spigot holes in which a central portion has been displaced to provide a circular depression on the friction material side and a circular projection on the side of the plate which bears against a piston, the projection fitting inside the hollow piston and resisting lateral movement of pad relative to piston. In this arrangement the circular depression in the back-plate acts as a large, blind, spigot hole and eliminates the need for normal spigot holes.

It is an object of the present invention to provide a disc brake pad without conventional spigot holes, which are prone to allow ingress of moisture into the back-plate friction material interface which causes corrosion, and without any projections on the back face of the back-plate, which complicate fitting of pads in situ and prevent use of conventional anti-squeal shims.

According to the present invention there is provided a disc brake pad comprising a back-plate of metal, a pad of friction material moulded thereon and an adhesive therebetween wherein that back-plate surface on which the pad is moulded is deformed in such a manner as to have indentations and projections to provide an enhanced key for the friction material without introducing projections on the opposite back-plate surface.

It will be appreciated that the back-plate of a pad according to the invention does not carry projections on the face opposite to the indentations, so that in many embodiments of the invention the face of the back-plate which contacts the brake piston can remain completely flat.

Alternatively projections from the back-plate on the face which is to receive the pad may be produced by a deformation which leaves depressions on that face of the back-plate which contacts the brake piston.

The back-plate may be manufactured by pressing indentations into the surface of the plate with a tool which allows displacement of the metal in order that projections from the back-plate will be forced up adjacent the indentations, an example of one such tool being a chisel type of tool.

The indentations in the back-plate may be produced in the same operation as punching of the back-plate from a metal sheet.

Metal back-plates for disc brake pads of the kind with which the present invention is concerned generally have a thickness in the range 3.5mm to 5.5mm, the commonest thicknesses being 4.5mm to 5.00mm. In the present

invention the maximum indentation depth will be dependant upon the back-plate thickness but the indentations do not extend beyond the mid-section of the metal of the back-plate. Preferably the indentation depth below the back-plate surface is not greater than 40 per cent of the thickness of the back-plate.

A typical indentation depth is about 1mm to 1.5mm with associated projections above the plane of the back-plate surface about 0.1mm to 0.50mm high.

The indentations should not extend to the extremities of the friction material pad and therefore it is preferred that all the indentations are located wholly within an area bounded by a notional line 5mm inboard of the edge of the pad of friction material.

It is not necessary that the whole of this area be covered by indentations and the minimum number of indentations would be that which gave a keying area in a plane perpendicular to the back-plate surface equivalent to the spigot holes which would normally be provided. This will vary according to the pad size and shape.

An alternative means of providing indentations is to deform the back-plate to create raised lands on the face which is to receive the pad, and allow depressions to be

created on the other face, and then cut grooves into the raised lands. This arrangement provides a convenient means of producing the indentations in designated areas.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings of which

Figure 1 is a plan view of a typical conventional back-plate with spigot holes.

Figure 2 is a schematic plan view of the back-plate of a disc brake pad in accordance with the invention.

Figure 3 is a cross-sectional view on line A-A of Figure 2

Figure 4 is a detail perspective view of indentations on the back-plate shown in Figure 2.

Figure 5 is a schematic plan view of a back-plate showing an alternative embodiment of the invention.

Figure 6 is a cross-section on line B-B in Figure 5.

Figure 7 is a schematic plan view of a back-plate showing a further embodiment of the invention.

Figure 8 is a cross-section on line C-C in Figure 7.

As illustrated in Figure 1 a conventional back-plate 1 is provided with spigot holes 2 which extend through the plate. These will contain friction material (not shown) when a pad of friction material is moulded onto the plate.

Figure 2 shows a schematic plan view of a back-plate 3 on that surface of which is to carry a pad of friction material, there being a plurality of indentations 4. That area of the surface of the back-plate 3 which will be covered by the pad of friction material is bounded by broken line 5, and the reduced area which shows the maximum area which can be occupied by indentations is bounded by the broken line 6. It should be noted that Figure 2 simply shows a sample number of indentations for schematic purposes, and the actual number in this embodiment is that which fills the area bounded by broken line 6.

As shown in Figure 3 the indentations are triangular in cross-section, their troughs 7 extending to a depth below surface plane P of the back-plate approximately equal to about 30% of the back-plate thickness. Peaks 8 are forced up by metal forced out of the indentations during manufacture and stand proud of the plane P but their height above plane P is less than the depth of the troughs 7.

In the detail perspective view shown in Figure 4 it will be seen that the indentations 4 are of a shape which may be formed by a plurality of chisel shaped tools and have blind ends 9 which assist in providing a physical key for friction material moulded onto them.

In the manufacture of a disc brake pad using a back-plate as shown in Figures 2 to 4 the pad of friction material may be moulded on to the back-plate by conventional means, the indented surface of the back-plate being de-greased and coated with adhesive as is usual.

The friction material typically consists of a polymeric binder such as a thermosetting resin, reinforcing fibres, fillers and friction modifier. During moulding under heat and pressure friction material fills the indentations 4 and provides a desirable keying action to enhance shear strength of the finished product.

Whilst the embodiment described has indentations of a particular preferred shape it will be appreciated that the shape and orientation of the indentations may be varied widely without departing from the scope of the invention.

In the embodiment of the invention illustrated in Figures 5 and 6 a back-plate 10 is provided in which the surface 11 on which a brake pad is to be moulded is provided with

raised lands 12. These are formed by deforming the whole back-plate leaving depressions 13 on the surface of the back-plate which is to contact the piston. The raised lands 12 are grooved, the direction of grooves 14 being varied from land to land, for example as illustrated in Figure 5, to ensure that there are keying surfaces facing in different directions.

In this embodiment the extent to which the raised lands 12 project above the surface 11 of the back-plate is to be kept to a minimum, in order to minimise the danger of the pad wearing away to expose them to the brake disc. Thus the height of the lands is kept to no more than half the thickness of the metal of the back-plate.

In the embodiment of the invention shown in Figures 7 and 8 a back-plate 15 is provided in which there are grooved areas 16 in a similar pattern to the previous embodiment but without any raised lands. The direction of grooves 17 is varied as before, and their depth is no more than half the back-plate thickness.

A back-plate of this type may be produced by machining, or by cutting holes into the back-plate and then bonding pre-grooved plugs into the holes.

The embodiments shown in Figures 5 to 8 are particularly suited to commercial vehicle disc brake pads, and such pads may be moulded on to them in the usual manner.

In order to illustrate the usefulness of this invention comparative tests were carried out as described in the Example below.

EXAMPLE

Disc brake pad back-plates of the same size and shape were prepared in three different ways, type A having no spigot holes, type B having indentations machined into the surface as in Figure 2 except that the machining produced no projections above the back-plate surface and type C having no spigot holes.

Disc brake pads were moulded on samples of each of the three types in the same die size using identical friction material mix. They were all pressed at 7 tonnes/square inch and then baked under identical conditions.

The sample pads were then tested for shear strength on a Denison machine in the usual manner. The results of the tests are given below in TABLE I.

TABLE I

Back-plate type	Shear (lbs)	Shear (psi)	% Material failure *
No spigot holes	15025	1473	100
Machined indentations	17700	1735	100
Standard spigot holes	13813	1354	100

* This figure indicates the type of failure which has occurred. 100% material failure shows that in each case shear failure has been within the friction material, and there was no bond failure between friction material and back-plate.

The tests show that back-plates made in accordance with this invention offer shear strength at least as good as the other back-plate types. They eliminate the possibility of corrosion in spigot holes, and yet provide a good keying action in the event of a bond failure, the latter condition being the one where spigotless back-plates are liable to create problems.

CLAIMS

1. A disc brake pad comprising a back-plate of metal, a pad of friction material moulded thereon and an adhesive therebetween wherein that back-plate surface on which the pad is moulded is deformed in such a manner as to have indentations and projections to provide an enhanced key for the friction material without introducing projections on the opposite back-plate surface.

2. A disc brake pad according to claim 1 in which the depth of said indentations below the back-plate surface is not more than 40% of the thickness of the back-plate.

3. A disc brake pad according to claim 1 or 2 in which no indentation in the back-plate extends to within 5mm of the edge of said pad of friction material.

4. A disc brake pad according to claim 1, 2 or 3 in which the depth of the indentations is 1mm to 1.5mm and there are adjacent projections above the plane of the back-plate surface about 0.1mm to 0.50mm high.

5. A disc brake pad according to claim 1, 2 or 3 in which the back-plate has raised lands on that surface on which the pad is moulded, said raised lands being grooved.

6. A disc brake pad according to claim 5 in which the height of the raised lands is not greater than half the thickness of the back plate.

7. A disc brake pad according to claim 1 substantially as described herein with reference to Figures 2 to 4 of the accompanying drawings.

8. A disc brake pad according to claim 1 substantially as described herein with reference to any of Figures 5 to 8 of the accompanying drawings.

Published 1991 at The Patent Office, Concept House, Cardiff Road, Newport, Gwent NP9 1RH. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.